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Analyzing connections between teacher and student topic-specific knowledge of lower secondary mathematics

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ABSTRACT

The interpretive cross-case study focused on the examination of connections between teacher and student topic-specific knowledge of lower secondary mathematics. Two teachers were selected for the study using non-probability purposive sampling technique. Teachers completed the Teacher Content Knowledge Survey before teaching a topic on the division of fractions. The survey consisted of multiple-choice items measuring teachers' knowledge of facts and procedures, knowledge of concepts and connections, and knowledge of models and generalizations. Teachers were also interviewed on the topic of fraction division using questions addressing their content and pedagogical content knowledge. After teaching the topic on the division of fractions, two groups of 6th-grade students of the participating teachers were tested using similar items measuring students' topic-specific knowledge at the level of procedures, concepts, and generalizations. The cross-case examination using meaning coding and linguistic analysis revealed topic-specific connections between teacher and student knowledge of fraction division. Results of the study suggest that students' knowledge could be associated with the teacher knowledge in the context of topic-specific teaching and learning of mathematics at the lower secondary school.

1. Introduction

In the last several decades, the field of mathematics education has been expanding its knowledge-base in understanding the role of different resources (including teacher characteristics among others) in student learning and achievement. The major shift in the field had happened in the late 80-s with Shulman's (1986) paper on teacher knowledge that proposed an alternative approach to the dominant at that time educational production function perspective (e.g., Monk & Rice, 1994), which was primarily concerned with examining proxies of teacher knowledge such as coursework and certification and its impact on student achievement (Charalambous & Pitta-Pantazi, 2016). Research on teacher knowledge initiated by work of Shulman (1986) has been focusing on teacher knowledge as a major predictor of student learning and achievement. Since then the field has benefited from numerous studies (Baumert et al., 2010; Hill, Shilling, & Ball, 2004; Hill, Ball, & Schilling, 2008) that substantially advanced the conceptualization of teacher knowledge and its different categories. Some scholars (e.g., Chapman, 2013; Izsak, Jacobson, & de Araujo,

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